PATENT
H0003569-3144

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Derek Raybould et al.	:	Confirmation No.: 1262
Serial No. 10/621,071	:	Group Art Unit: 1725
Filed: July 14, 2003	:	Examiner: Jonathan J. Johnson

For: LOW COST BRAZES FOR TITANIUM

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION OF DEREK RAYBOULD UNDER 37 C.F.R. 1.132

I, DEREK RAYBOULD, declare that:

1. I reside at 2 Horizon Drive, Denville, NJ 07834, and make this declaration of my own knowledge and belief.

2. I am a Senior Principle Scientist for Honeywell, Inc. ("Honeywell"). I am presently employed by Honeywell, and my office is located at Morristown NJ.

3. I received a Bachelors degree in Material Science & Metallurgy in 1968 from Imperial College, London University, UK and a Doctorate degree in Mechanical & Physical Metallurgy in 1971 from Imperial College London University, UK. I have worked on materials for aircraft at Honeywell for over 24 years.

4. At Honeywell I have worked on a variety of brazes for aluminum, titanium and superalloys, both as a user and supplier of braze powders. I worked for 4

years with Dr John Vollmer on titanium heat exchangers. During this time he wrote and filed US Patent 6,149,051, the content of which he discussed with me.

4. I am one of the inventors named in U.S. Patent Application No. 10/621,071 (the "current application"), filed July 14, 2003.

5. The current application is directed to a low cost braze for titanium. The claims of the current application are directed to improved brazes for titanium, especially for heat exchanger applications.

6. It is generally known to those of ordinary skill in the art that a repeatable uniform and consistent melt (braze) temperature is desirable, that this is best achieved by a prealloyed powder, and that the use of more expansive techniques such as rapid solidification to achieve an even more consistent and uniform melt temperature is often warranted and necessary to achieve good brazes.

7. It is generally known to one of ordinary skill in the art that while a wide range in braze temperature is desirable, a small change (+10°C) in melt (braze) temperature will result in either no brazing occurring if the melt temperature increases, or, if the melt temperature decreases, then melting will lead to erosion of the substrate i.e. melt through, both of which cases are unacceptable. This latter effect is of critical importance for thin sections as occur, for example, in a heat exchanger.

8. It is generally known to one of ordinary skill in the art that braze chemistry must be carefully controlled and checked and that periodically the melt temperature of the braze must be reconfirmed, usually with each new batch in order to avoid the above problems.

9. It is generally known to one of ordinary skill in the art that once a braze procedure has been established, changes of +10°C in the furnace temperature, due, for example, to a poor thermocouple or changes of +10°C of the braze melt temperature due, for example, to the braze chemistry being off specification, will result in problems with the braze joint. This being especially true for brazing thick to thin sections, for large parts and for brazing alloys, all of which apply to, for example, heat exchangers.

10. It is generally known to one of ordinary skill in the art that a braze should have a solidus and liquidus temperature that are close together. Preferred braze compositions are therefore eutectics or similar, which have the same solidus and liquidus. These compositions quickly melt at one temperature, but eutectics are at the bottom of troughs and a very small variation in chemistry will result in a large increase in melt temperature, i.e., the eutectic composition must be maintained. How tightly depends on the alloy.

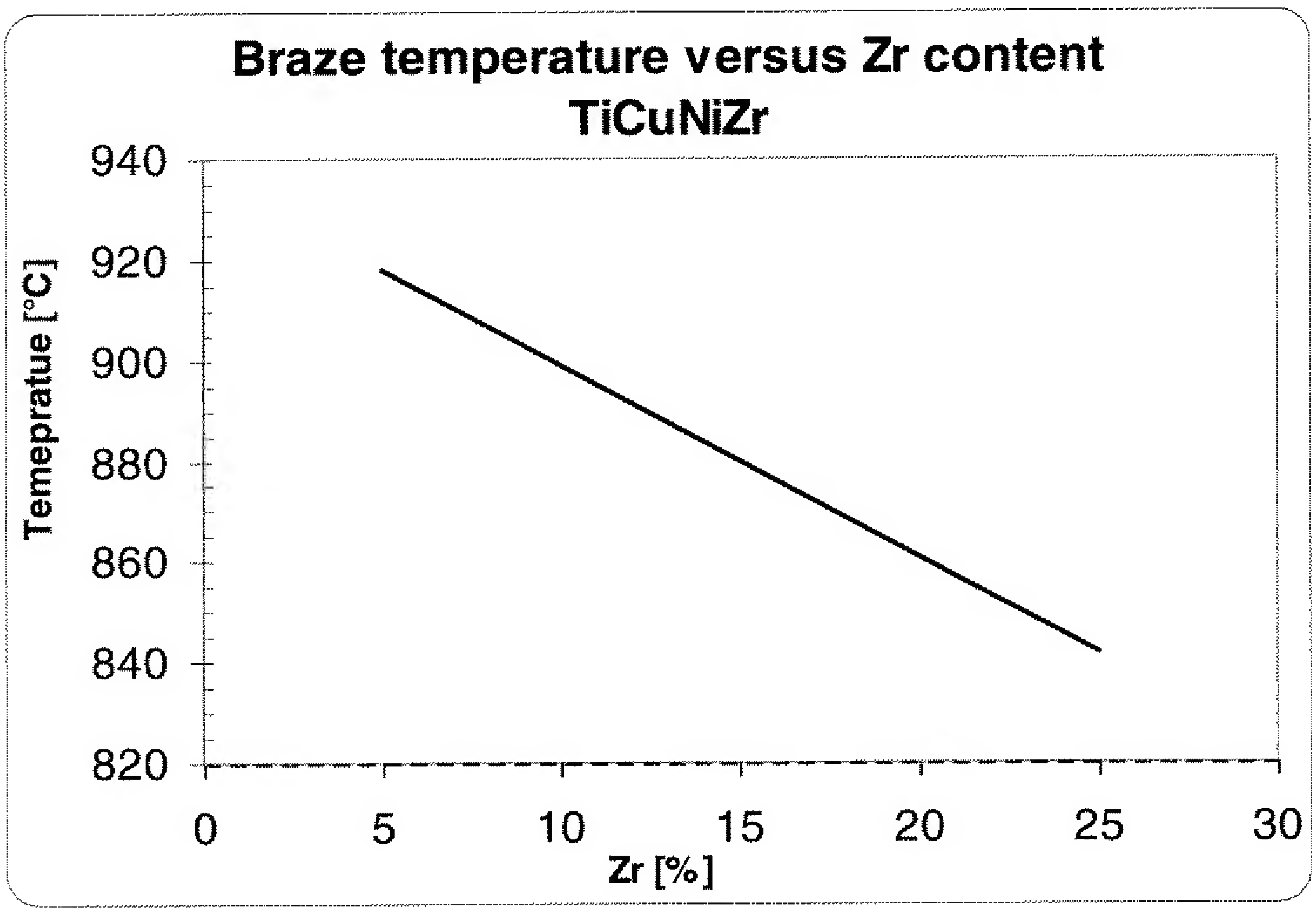
11. It is generally known to one of ordinary skill in the art that braze chemistry must be tightly controlled and typically is specified to +/-1% for critical elements, such as Zr and perhaps +/-3% for less critical elements such as Ti. In fact, the Honeywell specification for TiCuNiZr, written by J. Vollmer,

follows this rule and in fact is tighter having Ti controlled at less than 3%. This composition is for the preferred Ti20Ni20Cu20Zr of Volmer's patent The greater the number of key elements, e.g., Zr, Ni, Cu, the tighter the control of chemistry must be.

12. Applying the statement of paragraph 11 above to the present patent application, one having ordinary skill in the art would not interpret "about 15% Zr" to include 12% Zr, as Zr is a critical element that must be tightly controlled, typically to +/-1%, as declared above. At best, staying within these known and understood critical element limits (+/- 1%), 12% Zr may be taken to include 13% Zr and 15% Zr may be taken to include 14% Zr. Even taking the terms to this extreme, the amount of Zr does not overlap and one having ordinary skill in the brazing arts would not interpret "about 15% Zr" to include 12% Zr as is asserted by the Examiner.

13. Applying paragraphs 7, 8 and 9 from the above to the present patent application, in summary, braze chemistry must be, as is known to those of ordinary skill in the art, tightly controlled. If we consider varying the amount of Zr present in a braze composition between the two values (15 wt% and 12 wt%) (which the Examiner has concluded would be close enough to be an obvious variation), the following observations are made. The graph on the next page is created by a braze material made of a 22Ni 18Cu xZr alloy, wherein Zr is varied between 15 wt% and 12 wt%. The graph clearly shows that, in making this Zr variation, the braze temperature of this alloy changes by about 12°C.

Such a change would be recognized by one having ordinary skill in the brazing arts as being unacceptable. Therefore, a the marked change in braze temperature as the Zr wt% is varied from 15 wt% 12 wt% clearly indicates that one having ordinary skill in the art would not interpret "about 15% Zr" to include 12 wt% Zr.



14. One of ordinary skill in the art typically has a desired braze temperature in mind and specifications must be tightly controlled around that braze temperature. The Examiner has questioned why one would not start at 12 wt% Zr and tightly control that composition. The answer is that, if one of ordinary skill in the art was seeking a braze composition having the properties

of the braze in Vollmer, one would not try to adjust the Zr wt% outside that taught by Vollmer, because, as clearly evidenced above, such a change in Zr wt% would result in significant changes in the braze chemistry, including braze temperature.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the Subject Application or any patent which issues thereon.

Derek Raybould

Dated: 6/18/, 2007